

Automated Mileage and Stateline Crossing Operational Test

EVALUATION SUMMARY

FINAL REPORT

May 1,1996



US Department
of Transportation
Federal Highway
Administration



*Center for Transportation
Research and Education*



TABLE OF CONTENTS

<u>BACKGROUND</u>	2
PROJECT PARTNERSHIP	2
PROJECT GOAL AND OBJECTIVES	4
RELEVANCE TO THE NATIONAL ITS PROGRAM PLAN	5
OVERVIEW OF PROJECT METHODOLOGY	5
<u>Development, Testing, and Manufacturing of the Prototype Data</u>	
<u>Collection Device</u>	6
<u>Recruiting Motor Carrier Participants</u>	6
<u>Installing the Prototype Equipment</u>	7
<u>Beta-Testing the Prototype Equipment and Data Processing</u>	7
<u>Data Collection, Processing, and Record Keeping</u>	7
<u>Evaluation of the Prototype Equipment and the Project</u>	8
<u>Technology Transfer</u>	9
<u>Project Schedule</u>	9
<u>EVALUATION FINDINGS</u>	11
SUMMARY OF THE TRUCK SYSTEM AND EDI EVALUATION	
FINDINGS	11
<u>Truck System</u>	11
Technical Performance and Projected Equipment Costs	12
<u>Feasibility of Integration</u>	15
<u>Acceptability of Data for IFTA and IRP Compliance</u>	16
<u>Truck System and Electronic Data Interchange Evaluation</u>	
<u>Conclusions</u>	18
SUMMARY OF STATE COSTS, BENEFITS, AND ACCEPTANCE	
EVALUATION FINDINGS	18
<u>Potential Benefits and Cost Savings for IFTA Processing and</u>	
<u>Auditing Administration</u>	19
Processing Benefits	19
Auditing Benefits	20
<u>State Agency Perceived Benefits and Receptivity</u>	21
Perceived Benefits	21
Receptivity to Electronic Mileage Data Collection and	
Electronic Filing	23

<u>State Legal and Institutional Issues</u>	23
Institutional Issues	23
<u>State Evaluation Conclusions</u>	24
<u>Summary of Motor Carrier Benefits and Acceptance Evaluation</u>	
<u>Findings</u>	25
<u>Key Motor Carrier Evaluation Findings</u>	25
Motor Carrier Acceptability	26
Motor Carrier Issue	26
Motor Carrier Costs/Benefits	26
<u>Motor Carrier Evaluation Conclusions</u>	27
EVALUATION SUMMARY OF TECHNOLOGY TRANSFER	
EFFORTS	27
<u>Newsletter</u>	28
<u>Presentations</u>	28
<u>Technolow Transfer Conclusions</u>	29
<u>EVALUATION CONCLUSIONS</u>	29
NEXT STEPS FOR IMPLEMENTATION	29

LIST OF TABLES

Table 1.1 Schedule of Project Events	9
Table 1.2 Summary of Truck System Operation	13
Table 1.3 Cost Estimates for Hypothesized Motor Carriers	15

BACKGROUND

The Automated Mileage and Stateline Crossing Operational Test (AMASCOT) demonstrated and evaluated the feasibility of automating the collection of mileage by jurisdiction data and electronic data interchange for International Fuel Tax Agreement (IFTA) and International Registration Plan (IRP) reporting. The test involved the states of Iowa, Minnesota, and Wisconsin and motor carriers from these three states. The test equipped 30 interstate commercial vehicles with prototype electronic mileage by jurisdiction data collection devices, collected mileage by jurisdiction data from the vehicles as they operated throughout the United States and Canada in their normal course of business, integrated this mileage data with fuel purchase data to generate the data necessary for IFTA reporting, and evaluated the ability of an electronic mileage data collection system and the data generated to meet IFTA and IRP requirements. The test also investigated the feasibility of transmitting IFTA and IRP reporting data electronically from the motor carrier to the base jurisdiction.

The catalyst for developing the project was created by Title IV of the Inter-modal Surface Transportation Efficiency Act of 1991 (ISTEA-91). This legislation supported reducing the fuel tax and registration compliance burden for commercial vehicle operators by requiring states to join IFTA and IRP by September 30, 1996. These organizations simplify motor carrier compliance by eliminating the need for motor carriers to file fuel tax and mileage reports with each individual jurisdiction by allowing them to file a composite report for all member jurisdictions to a single base-state meeting the requirements for primary place of business.

The standardization of processes and data requirements created by membership in IFTA and IRP allows for automating data collection and filing processes. The requirement that all states join IFTA and IRP created the opportunity to introduce improved methods for states to administer and motor carriers to comply with IFTA and IRP, thus making a significant leap in IFTA and IRP administration and compliance possible.

Realizing the importance of this opportunity, AMASCOT was developed to test and evaluate an innovative application of technology that would facilitate the nation's productivity and growth while supporting states efforts in complying with the requirements of Title IV of ISTEA-91.

The project was proposed in response to a Federal Highway Administration (FHWA) solicitation for Intelligent Transportation Systems (ITS) projects in 1992 and approved for FHWA funding in 1993. Begun in January 1994, the project concludes with the issuance of this project evaluation report in March 1996.

PROJECT PARTNERSHIP

The AMASCOT project was conducted by a unique partnership of private, public, and academic transportation organizations, that included:

Iowa Department of Transportation (Iowa DOT). The Iowa DOT is involved in the project as the lead state agency for contract administration and as a participant due to its responsibility for administration of IFTA and IRP programs.

Rockwell International Corporation. A well-known technology supplier to defense, aviation, communications, and transportation industries, Rockwell provided the project with the in-vehicle locational, computing and trip recording, and electronic data transfer capabilities.

Rand McNally-TDM, Inc. Rand McNally-TDM, Inc. is a well-known provider of routing and mileage software to the transportation industry. Rand McNally provided the project with custom route mileage software that converted the global positioning system (GPS) locational information collected by Rockwell into nearest actual locations (as matched to a map database) and identified taxable and nontaxable mileage segments.

Center for Transportation Research and Education (CTRE). Formerly the Iowa Transportation Center, CTRE at Iowa State University specializes in transportation research, technology transfer, education, and outreach for public transportation agencies and the private sector. CTRE provided project management, technology transfer and outreach, data processing, and evaluation coordination and conduct support to the AMASCOT.

Minnesota Department of Public Safety (MnDPS). MnDPS participated in AMASCOT as the Minnesota agency responsible for IFTA and IRP administration.

Wisconsin Department of Transportation (WDOT). WDOT participated in AMASCOT as the Wisconsin agency responsible for IFTA and IRP administration.

Western Highway Institute/ATA Foundation (WHI/ATAF). WHI/ATAF is a non-profit motor carrier research and education organization affiliated with the American Trucking Associations. WHI/ATAF worked with the state trucking associations to identify and recruit motor carriers and led the evaluation efforts related to motor carrier operations.

Iowa Motor Truck Association (IMTA). IMTA is a membership organization that represents the interests of the motor carrier industry in Iowa to lawmakers, regulatory agencies, and the public. The IMTA provided assistance in involving motor carriers in the project for the operational test phase and evaluation efforts, served as a conduit of project-related information to and from Iowa motor carriers, and helped guide the project through the Steering Committee.

Minnesota Trucking Association (MTA). MTA represents the interests of its motor carrier members to lawmakers, regulatory agencies, and the Minnesota public. The MTA assisted the project in recruiting motor carriers, disseminating information about the project to motor carriers, and providing project guidance through the Steering Committee.

Wisconsin Motor Carriers Association (WMCA). WMCA is a membership organization that represents the interests of Wisconsin motor carriers to lawmakers, regulatory agencies, and the public. WMCA participated in the project by assisting in the recruitment of motor carriers, providing information exchange between the project and motor carriers, and furnishing project guidance through the Steering Committee.

Federal Highway Administration (FHWA). FHWA provided the project with contract funding, high-level project oversight, and evaluation guidance.

To provide project and evaluation guidance, a steering committee and an evaluation subcommittee were formed and chair persons selected. High level project direction and policy decisions were made by these committees and day to day activities were managed by CTRE on coordination with the lead state and the project subcontractors.

PROJECT GOAL AND OBJECTIVES

The goal of the partners was to demonstrate and evaluate technology to automate the collection and filing of motor carrier mileage and gallonage data and reports for Commercial Vehicle Operations (CVO) fuel tax and registration apportionment.

Objectives developed to attain this goal include:

- . Ensure the automated mileage and stateline data collection and submittal system accommodates state auditing guidelines;
- . Develop procedures and software to electronically submit the fuel use and apportioned mileage report to the base-state jurisdiction;
- . Test and evaluate the technology to determine requirements necessary to support state auditing guidelines and electronic submittal to base-state jurisdictions;
- . Conduct an analysis of user acceptance and the benefits and costs of employing the technology for both motor carriers and states;
- . Conduct a technology transfer program to include workshops, a newsletter, and presentations at professional and industry meetings.

In pursuit of the project goal and objectives, the AMASCOT partners utilized the following technologies and processes during the test:

- . In-vehicle GPS coupled with a jurisdictional boundary database and stateline crossing algorithm to detect vehicle entrance into and exit from U.S. and Canadian jurisdictions;

- . In-vehicle data recording of significant vehicle events, route of travel, and a sequential mileage record of the vehicle's travels;
- . Modified mileage and routing software and locational database for post data collection conversion of GPS coordinates into nearest known location (city, highway, truckstop, etc.) and identification of taxable/non-taxable mileage segments;
- . Commercially-available database software and custom data file conversion programs to compile vehicle mileage by jurisdiction and fuel purchase information and generate acceptable IFTA quarterly report;
- . Electronic transmission of vehicle mileage by jurisdiction information, fuel purchase information, and IFTA quarterly reports.

Other technologies and approaches could have been used to meet the project goals and objectives. The technologies and processes used were a result of the areas of expertise of the project partnership and were developed specifically to meet the test goals and objectives. As a result, the equipment and processes used during the test only generally represent those that might be developed and utilized if an actual marketplace develops.

RELEVANCE TO THE NATIONAL ITS PROGRAM PLAN

The AMASCOT project falls under the CVO Administrative Processes service of the National ITS Program Plan. The CVO Administrative Processes service is intended to reduce the time and paperwork necessary for motor carriers to comply with and states to administer the regulatory processes for vehicle licensing, permitting, and fuel tax filing, and thus enhance the productivity of motor carriers and states. The AMASCOT project specifically focused on the administrative processes related to IFTA and IRP mileage record keeping and filing requirements.

AMASCOT succeeded in proving the concept of automated mileage and route data collection and electronic filing for complying with commercial vehicle fuel tax and registration apportionment requirements. This success provides jurisdictions, technology providers, and motor carriers the incentive to begin developing and implementing the necessary hardware, software, and procedures for automated mileage-by-jurisdiction data collection and electronic filing for compliance with IFTA and IRP. Further, the test provided critical insights into the type and significance of changes in business processes necessary for jurisdictions and private industry to implement such automated fuel tax mileage data collection and electronic filing.

OVERVIEW OF PROJECT METHODOLOGY

To demonstrate and evaluate the feasibility of automating both the collection of mileage data and the filing of the reports required for motor carrier registration and fuel tax apportionment, the basic test design was to install and operate prototype, automated mileage data collection

equipment developed by Rockwell International on thirty trucks - five trucks from each of six participating motor carriers, two carriers from each of Iowa, Minnesota, and Wisconsin.

The basic project methodology included these tasks:

- . Prototype development, testing, and manufacturing;
- . Motor carrier recruitment;
- . Equipment installation;
- . Equipment and data processing beta-test;
- . Data collection, processing, and archiving;
- . Evaluation of the prototype equipment and the project;
- . Technology transfer.

Development, Testing, And Manufacturing Of The Prototype Data Collection Device

Development of the prototype device was guided by IFTA and IRP requirements for automated data collection devices. Interpretation and clarification of these requirements was provided by the state agencies involved in the test.

To ensure the validity of the concept before moving forward with the operational test portion of the project, an early prototype was developed and a test conducted. The validity test was conducted in June 1994 on a route specified by IFTA and IRP auditors from the participating states. Both state auditors and motor carriers participated in the test, riding in the vehicle equipped with the early prototype system and gathering manual mileage data to compare to the data collected by the system. In addition to the data comparison, other tests were conducted, such as disabling the system antenna to note how the system handled the problem and if usable exception data was recorded. The prototype system met the validity test requirements and was approved for development for the operational test. More information on the validity test can be found in the AMASCOT Phase 1 Interim Report.

Integrating changes as suggested by the results of the validity test, Rockwell then manufactured the prototype data collection devices to be used in the operational test portion of the project. The Iowa DOT (contract manager) and the CTRE (project manager) inspected and accepted delivery of the prototype data collection devices in August 1994.

Recruiting Motor Carrier Participants

Recruiting motor carriers focused on ensuring a large enough motor carrier and vehicle participation to provide adequate data, identifying carriers based within the participating states, and ensuring the recruited carriers covered a broad range of industry operating characteristics. The test design specified the test include six motor carriers, two from each state, and equip five vehicles from each motor carrier for a total of 30 trucks.

Motor carrier recruitment was coordinated with the ATA-affiliated state trucking association of each participating state and received input from participating state IFTA and IRE' administrators

AMASCOT

and auditors and Rockwell. Recruiting activities included identifying candidate carriers in each state, conducting a recruitment interview to exchange information about the project and the motor carriers' operations, and approval of recommended motor carriers by the Steering Committee.

Installing The Prototype Equipment

Equipping motor carriers' vehicles was undertaken following approval by the Steering Committee and agreement to participate by the recruited carriers. Installations were either performed in Cedar Rapids, Iowa, at a Rockwell provided installation center or at the motor carriers' locations of business by Rockwell technicians. Due to the logistics of equipping operating motor carrier fleets without disruption their operation, installation of the equipment took several months and led to a number of lessons learned (see the Evaluation Results section of this document).

Beta-Testing The Prototype Equipment and Data Processing

To ensure the prototype equipment and the data processing methods developed would be suitable for the operational test, the prototype equipment and the data processing methods were beta-tested. The time between installation of the first prototype data collection units in vehicles and completion of installation of the equipment in all the vehicles was used for beta-testing. Originally, this beta-testing was expected to last approximately 6-8 weeks. However, difficulties in coordinating the installations with vehicles operating across the country as well as some issues uncovered during the beta-test stretched this period to several months.

During the beta-test, data was collected and processed for all equipped vehicles. As more vehicles joined the equipped fleet, more data was collected and processed. The beta-test was very successful in ensuring the usability of the prototype equipment and data processing methods before collection of official evaluation data. Several issues were uncovered and corrected during the beta-testing, leading to a fairly uneventful collection of data during the official 90-day evaluation data collection period. For more information on these issues, see Section 2, Evaluation Report on the Truck System and Electronic Data Interchange.

Data Collection, Processing, And Record Keeping

Data collection, processing, and record keeping efforts focused on retrieving the data from the vehicles, processing it with fuel information to produce the data and reports required for IFTA filing, and maintaining the records required for IFTA auditability. The source data and the resulting reports would be evaluated by state auditors for acceptability under the current IFTA requirements. To provide enough data to enable multiple evaluation analyses, data collection was specified to include a minimum of 90 days of data collection from each five-truck fleet.

The prototype equipment utilized GPS and on-board logic to identify an equipped vehicle's starts, stops, and exits from one jurisdiction into another and record the vehicle's mileage and position at such events. For a more detailed description of the on-board data collection system,

see the Phase I Interim Report and Section 2, Evaluation Report on The Truck System and Electronic Data Interchange, of this document.

The data collected on-board the vehicle was communicated from the vehicle to Rockwell via satellite communication once per day. Once per week, Rockwell combined the dally data packets for each truck into a continuous ASCII data file for each truck. Rockwell then communicated the data via modem to the CTRE for processing. Processing of the mileage data by the CTRE included conversion of latitude/longitude data into location place names and highway designators, importing of the data into commercial database software, processing of the data to accumulate mileage by jurisdiction, and integration of the mileage data with fuel purchase data to generate reports that could meet IFTA requirements. The source data used to generate the IFTA reporting information was kept in an electronic archive to ensure availability of the data for audit as required by IFTA. A more detailed description of the data processing methods can be found in Section 2, Evaluation Report on the Truck System and Electronic Data Interchange.

Evaluation Of The Prototype Equipment And The Project

Evaluation of the equipment focused on whether the automated data collection system could generate data that could meet IFTA and IRP requirements, the feasibility of electronically communicating the report data to a base jurisdiction, the impacts such a system might have on states and motor carriers in terms of costs and benefits and changes to current processes, and the institutional issues related to implementation of automated data collection and electronic filing. The project partners formed an Evaluation Subcommittee that oversaw the evaluation effort and evaluation task forces that helped in the detailed guidance and conduct of the evaluation efforts.

The evaluation of the automated mileage data and its suitability for IFTA and IRP reporting was conducted primarily by the participating IFTA and IRP auditors from each state. These auditors evaluated the prototype system and the mileage and route data it generated using IFTA and IRP guidelines for electronic data collection and accepted audit techniques.

The technical performance of the prototype data collection equipment, the data processing methods, and the feasibility of electronic data transfer were also evaluated. Rockwell and CTRE conducted these efforts.

The state evaluation efforts focused on documenting the possible impacts of automated data collection on the participating states' processes, possible costs and benefits, general receptivity, and possible institutional issues. This portion of the evaluation was completed by CTRE with assistance from the participating state agencies.

The evaluation of motor carrier costs, benefits, and likelihood of implementation was conducted by WHI/ATAF with guidance from the Evaluation Subcommittee. These efforts focused on identifying the applicability of automated mileage data to motor carrier operations, the likelihood of motor carrier adoption of automated mileage data collection technology, and motor carrier implementation issues.

Technology Transfer

Technology transfer efforts during the project focused on informing fuel tax and registration administrators and auditors and motor carriers of the project. Technology transfer efforts included publishing a project newsletter, distributing project reports, and making presentations to state fuel tax and registration administrators and auditors, motor carriers, and other public and private audiences interested ITS-CVO applications.

Project Schedule

To give a frame of reference to the course of the project, the Table 1.1 lists a number of significant project events.

Table 1.1
Schedule Of Project Events

Event	Start	End
AMASCOT Project	January 10,1994	March 31,1996
Proof of Concept	January 1994	June 1994
Kick-Off Meeting	March 1994	
Evaluation Plan	January 1994	March 1994
Phase 1 Validity Test	March 1994	June 1994
Phase 1 Interim Report	August 1994	
Recruit Motor Carriers	April 1994	October 1994
Install Equipment	August 1994	April 1995
Beta-test Equipment and Processes	December 1994	April 1995
Official Data Collection	May 1995	July 1995
Draft Evaluation Reports	January 1996	
Final Evaluation Reports	April 1996	

The participating motor carriers and their operating characteristics were:

Roehl Transport Inc. is a large for-hire truckload carrier based in Marshfield, Wisconsin. Roehl operates approximately 900 units in flat-bed and van transportation, with approximately 450 of those units operating on interstates in the contiguous 48 states. Roehl uses computer aided functions extensively in its operations and has equipped its fleet with in-vehicle tracking and communications systems.

Skinner Transfer is a smaller for-hire truckload carrier operating 135 units out of Reedsburg, Wisconsin. Skinner provides both flat-bed and van transportation in the contiguous 48-states with substantial mileage east of the Mississippi River. Although Skinner uses computer aided functions in its administrative operations, the company has no current plans for employing on-board tracking and/or communications systems.

Johnsrud Transport, Inc. is a medium-sized for-hire special commodities carrier typically operating 80 to 90 food-grade tank truck units. Johnsrud is based in Des Moines, Iowa, and operates in the contiguous 48 states, although service in the extreme northeast U.S. is not currently heavy. Johnsrud utilizes computers in most functional areas but does not utilize in-vehicle tracking or communications equipment and has no immediate plans to integrate such equipment.

Caledonia Haulers, Inc. is a small for-hire special commodities carrier based in Caledonia, Minnesota. Caledonia operates 40 food-grade tank units throughout the U.S. but with heavy emphasis on service in the midwest. Caledonia's operations did not utilize in-vehicle communications or tracking during the course of AMASCOT, however computerized dispatch and maintenance functions were in use.

CENEX, Inc., based in St. Paul, Minnesota, is a large private carrier operating 240 tractors and 1,000 trailers in delivery of various agricultural services including the transport of hazardous materials. CENEX operates from the midwest south to Texas, west to Washington, and north into Canada. Computer aided functions are utilized throughout the company with portable cellular telephones the current means of in-vehicle communications.

Ruan Transport Corporation, with headquarters in Des Moines, Iowa, operates 6,000 tractors and 4,000 trailers in numerous fleets serving the contiguous 48 states through a network of 174 terminals. The particular Ruan fleet participating in the test operates out of a terminal in Milford, Iowa and provides primarily a truckload service with some less-than-truckload (LTL) operations. Ruan utilizes computer aided functions as well as in-vehicle tracking and communications systems extensively in its operations.

Hyman Freight-ways, Inc. is a regional LTL common carrier with their headquarters terminal located in Roseville, Minnesota. Hyman was the candidate carrier interviewed as a representative of the LTL transportation sector. Their trucks were not equipped with the Rockwell recording device due to a pre-judgment concerning probable irrelevance. While the company had no actual evaluation involvement, their mileage recording and reporting procedures were analyzed and documented by CTRE as a contribution to the broader project emphasis which also recorded existing fuel-use reporting practices. Hyman operates 430 tractors, 725 semi-trailers, 1,016 doubles trailers, and 12 straight trucks in 17 states spanning Colorado to Ohio and Canada to Texas. The company incorporates computer-aided functions but does not utilize in-vehicle tracking or communications.

EVALUATION FINDINGS

The evaluation summary encompasses the three major areas of evaluation -- truck system and electronic data interchange (EDI); state agency costs, benefits, and acceptance; and motor carrier acceptance and benefits - and technology transfer efforts and lessons learned. These sections provide an overview of the evaluation efforts and highlight the major evaluation findings. More detailed information on the AMASCOT evaluation can be found in the individual reports for the three major evaluation areas.

SUMMARY OF THE TRUCK SYSTEM AND ED1 EVALUATION FINDINGS

The following is a summary of the evaluation of the automated mileage by jurisdiction data collection system and electronic data transfer for IFTA and IRP filing. The truck system and ED1 evaluation achieved the following goals:

- determine the modifications to IFTA and IRP procedures necessary to accommodate electronic mileage data collection;
- evaluate the feasibility of using currently available communications and database software for electronically submitting IFTA and IRP reports to base states;
- . determine the acceptability of the data provided by the truck system.

Detailed discussion of the truck system and ED1 evaluation results can be found in the Evaluation Report on the Truck System and EDI.

For this summary, discussion of the evaluation of the truck system and ED1 is categorized into three primary areas: 1) evaluation of the technical performance of the prototype truck system data collection equipment; 2) evaluation of the feasibility of integrating such a system into motor carrier and state business practices; and 3) evaluation of the acceptability of the data generated by the automated system for IFTA and IRP compliance.

To meet the data needs of IFTA and IRP, the automated data collection system developed for AMASCOT needed to be able to accurately record vehicle route of travel and mileage traveled in each jurisdiction along the route of travel and generate data that was suitable for IFTA and IRP reporting and auditing. The evaluation of the truck system and ED1 is based on the analysis of nearly one million miles of data collected and processed using the prototype automated electronic mileage data collection system and processes developed to use the collected data as a basis for generating reports and records that meet IFTA and IRP requirements.

Truck System

The technologies used in the AMASCOT truck system were GPS, the jurisdiction detection algorithm/database, and the mileage and route data collection/storage algorithm. These

technologies established the foundation for automatic detection and collection of miles traveled in each jurisdiction by a vehicle.

In Phase I of the project, the prototype data collection device was developed and tested. The device consisted of a consumer off-the-shelf (COTS) computer board, a GPS receiver, a sophisticated algorithm for detecting a jurisdictional boundary crossing, and a compact database defining jurisdictional boundaries in the United States and Canada. Jurisdictional boundaries in Mexico were not included since U.S. based motor carriers are not allowed to operate their power units in Mexico beyond a very small free range of trade along the border. This prototype system was validity tested to determine the feasibility of continuing forward with the operational test portion of the project. For more details on the Phase I system and the validity test, see the Phase I Interim Report dated August 1995.

In Phase II of the project, the Phase I hardware was modified to a design that would more appropriately allow extended use onboard a heavy duty vehicle. In addition, improvements and corrections to the Phase I jurisdictional boundary crossing detection algorithm and jurisdictional boundary crossing database were made as indicated by test results. To expedite the test, COTS equipment was used as much as possible. This equipment consisted of a COTS single-board computer (SBC) integrated into standard Rockwell Pro 2000 and Link 2000 satellite communications gear. The COTS SBC hosted the Phase I automatic jurisdiction boundary crossing detection algorithm, jurisdiction boundary database, and the data collection function. The Pro/Link 2000 equipment provided a convenient means to retrieve the data from each test vehicle via satellite communications, thus eliminating the need to make physical contact with the vehicles to collect data.

The truck system recorded data, called Driver Trip Reports (DTR), contained a history of starts, stops, route samples, border crossings, and system exceptions. System exceptions include such things as loss of position information, loss of odometer, and unexpected power losses. These recorded exceptions allow for automatic system monitoring of the DTR information collected. DTR files also contain a unique sequence number, driver ID, carrier ID, and vehicle ID.

Technical Performance And Projected Equipment Costs

The prototype truck system was operated in a number of vehicles from January 1995 through April 1995 and in the actual 90-day, 30-vehicle, data collection period from May 1995 through July 1995. Table 1.2, on the following page, summarizes the operational details of this experience.

Table 1.2
Summary Of Truck System Operation

Company	Events			Miles			Crossings		
	Pre-Test	Test	Subtotal	Pre-Test	Test	Subtotal	Pre-Test	Test	Subtotal
Caledonia		9,072	9,072		143,119	143,119		645	645
Cenex	8,836	12,553	21,389	143,000	129,957	272,957	473	534	1,007
Johnsrud	2,078	10,060	12,138	44,314	115,211	159,525	92	460	552
Roehl	9,335	9,854	19,097	144,602	142,412	287,014	669	627	1,293
Ruan	3,438	8,060	11,498	49,752	123,579	173,331	221	547	768
Skinner	4,576	13,687	18,263	72,297	302,563	374,860	3571	536	a93
Total			91,457			1,410,805			5,158

Evaluation of the prototype data collection system resulted in the following findings:

- . Accurate, repeatable determinations of jurisdictional border crossings are available through an electronic system. Of the 3,349 border crossings logged during the official data collection period, border crossing detection was within +75 feet.
- . System operation anomalies in the prototype system were minimal. In over 1.4 million miles of data collection (pre-test and test), the prototype system experienced just four types of instances in which jurisdictional border crossings were not detected. These four instances included: (1) a missing data point in the jurisdictional boundary database; (2) a GPS data smoothing filter that resulted in the position error being too small; (3) a unit experienced intermittent power that resulted in missed border crossings; and (4) the error budgeted for Selective Availability (the signal degradation purposely introduced into GPS by the United States Department of Defense) was set small enough that a border crossing could be missed in rare instances. Of these instances, (1) and (2) were corrected before the 90-day data collection period, (3) was an equipment failure related to improper installation, and (4) would be eliminated as an issue in a production device by setting the Selective Availability error budget to a more appropriate value.

In general, the technical evaluation concluded that GPS could be used to accurately and consistently detect jurisdictional border crossings made by a moving vehicle. The issue of whether or not the travel data collected by the prototype system would be sufficient for IFTA and IRP is addressed in the evaluation of data acceptability.

Costs for motor carrier implementation of an automated mileage and route data collection system similar to that used in AMASCOT were estimated by motor carrier experts. These experts

included the AMASCOT technology provider, representatives from leading motor carrier business software developers, and motor carriers.

Using these costs estimates, three types of motor carrier operating and implementation scenarios were hypothesized. In general, these three hypothesized motor carriers included:

- (1) a **smaller carrier not already utilizing GPS and satellite communications** for vehicle tracking; carrier has **basic office automation for business functions** (IFTA/IRP, payroll, etc.).

Without GPS and communications already in place, carrier needs GPS and associated equipment to collect data, some means for retrieving the data from the vehicles, and major business system software upgrades to incorporate the electronic data

- (2) a **medium-sized carrier that is utilizing GPS and cellular communications for vehicle tracking**; carrier has **well-developed office automation** for fleet management and business functions, **including EDI**.

With GPS and communications already in place, the carrier can piggy back the electronic data collection system onto current vehicle GPS/communications equipment to collect and communicate mileage data. Carrier needs only minor business system software upgrades to incorporate the electronic data. Cellular communications costs for data transmission will be a variable cost.

- (3) a **large carrier using GPS and both satellite and cellular communications for fleet management**; carrier has **advanced office automation system** for business and fleet management functions, **including EDI**.

With GPS and communications already in use by this carrier, the carrier can add the electronic data collection system to current vehicle GPS/communications equipment to collect and communicate mileage data. Carrier needs very minor business system software upgrades to incorporate the electronic data. Data communications costs will be a variable cost.

The general cost estimates developed by equipment and software providers and motor carriers and the cost examples for hypothesized carriers support the following conclusion:

- . Equipment will be affordable. Cost estimates for the on-board equipment and other supporting hardware and software indicate that carriers that employ satellite communications and vehicle location tracking systems could add automated electronic mileage by jurisdiction data collection and integrate the data into their business systems for as little as \$400 per vehicle.

Cost estimates for the hypothesized motor carriers are summarized in Table 1.3 on the following page.

Table 1.3
Cost Estimates For Hypothesized Motor Carriers

Cost Category	Small Carrier 30 Trucks	Medium Carrier 200 Trucks	Larger Carrier 1,200 Trucks
In-Vehicle Recorder	\$600 - 800 /truck	\$400 - 500 /truck	\$400 - 500 /truck
Data Extraction			
Vehicle Equipment	\$300 - 400 /truck	(Cellular costs'	Satellite/cellular costs]
Terminal Equipment	\$800 RF Modem \$2,000 Computer		
Data Processing Upgrades	\$5,000	\$1,000	Staff time
Report Communications			
Modem	\$100	Already equipped	Already equipped
Software	\$100	for EDI	for EDI
Data Archiving/Auditing			
Data Storage Costs	\$0 May be a net gain	\$0 May be a net gain	\$0 May be a net gain
Conversion Software	\$1,000	\$1,000	\$1,000
Total	\$36,000 - 45,000	\$82,000 - 102,000	\$481,000 - 601,000
Total per Truck	\$1,200 - 1,500	\$410 - 510 + communications costs	\$401 - 501 + staff time and communications costs
Communications costs for cellular and/or satellite data transmission were not estimated due to their wide variability			

Feasibility Of Integration

The evaluation of the feasibility of integration investigated the resources required for and issues encountered in utilizing the electronic mileage and route data for generating IFTA and IRP compatible records and reports. In general, this portion of AMASCOT consisted of retrieving the data from the participating vehicles and performing the data processing necessary to integrate the data with fuel purchase information, generate vehicle mileage and fuel purchase summaries and mock IFTA reports, and maintain vehicle records acceptable for IFTA and IRP auditing.

In addition, electronic transfer of data was tested. In fact, the entire data collection and processing path was entirely electronic for one motor carrier who was able to provide fuel purchase data in an electronic format. A test of EDI between AMASCOT and the Iowa DOT was planned but was not completed because the necessary state programming resources were not available.

Key questions related to the feasibility of integration included;

Could current software readily accept the data with only minor modifications?

Could the data be used to generate acceptable IFTA/IRP reports?

Is an electronic data path from vehicle to carrier to state feasible?

Findings related to these questions include:

- . Commercially available database software can be used to integrate the electronic mileage by jurisdiction data with fuel purchase data and generate the necessary fleet reports for IFTA and IRP.
- . Successfully demonstrated an entirely electronic data path from vehicle to processing, including fuel purchase information. Testing of the AMASCOT system clearly demonstrated that mileage data could be collected electronically, communicated electronically, and integrated with electronic fuel purchase data to meet IFTA requirements.
- . States that can easily integrate database format files into their systems can accept electronic transfer of IFTA and IRP reports with relatively minor changes to their data processing software. Commercially available database applications and motor carrier software packages can export data in a database file format which can be integrated into both commercial and custom software through relatively straightforward data mapping routines. However, while these changes are relatively straightforward, states dependent upon internal programming staff may not have staff time or funding available to make these changes.
- . The biggest challenges for states may be in achieving standards and facilities for electronic data transfer, some method for electronic payment to accompany electronic IFTA and IRP filings, and marshalling the resources to make the necessary modifications to their software.
- . Upgrading commercially available motor carrier software to integrate electronic mileage data will be relatively inexpensive. In a meeting with leading motor carrier software providers and motor carriers, estimates for modifying commercially available motor carrier software to integrate the electronic mileage by jurisdiction information ranged from \$1,000 to \$5,000 with most participants expecting the cost to be at the low end of this range.

Acceptability Of Data For IFTA And IRP Compliance

The acceptability of the data for IFTA and IRP compliance was evaluated by IFTA and IRP auditors from Iowa, Minnesota, and Wisconsin. The data collected on-board the vehicles was integrated with fuel purchase information and processed to produce filing reports that followed

IFTA requirements. For the evaluation, the test data was first examined by the state auditors for its potential to meet IFTA and IRP requirements. Then, the test generated IFTA reports were audited by the state auditors using the electronically collected data as the mileage and route records for the reports.

After close examination of the test data, the state auditors concluded that the AMASCOT system was able to:

- . Determine jurisdictional border crossing points and record accurate odometer readings at those points;
- . Accurately accumulate distance, in total and by jurisdiction, including distance on routes designated as non-taxable for purposes of this test;
- . Provide information about other truck activity, including trip starting and stopping points, periods of no movement, engine shutdowns, etc.;
- . Assign a recognizable place name to each latitude-longitude location reading kept by the system.

The reports and data were audited using several audit techniques commonly used by state IFTA and IRP auditors. These included comparing the test mileage data to:

- (1) Odometer/hubometer miles as recorded by drivers;
- (2) Miles calculated by state auditors using current computer atlas software (such as Rand-McNally Milemaker or PCMiller) over the route of travel as recorded by drivers;
- (3) Miles calculated using computer atlas software over the route of travel as indicated in the drivers' United States Department of Transportation (U.S.DOT) log books;
- (4) Miles calculated using computer alias software over the route of travel as indicated by locational information recorded by the AMASCOT system.

After auditing the test generated reports and the corresponding electronic mileage data for the test vehicles, the state auditors concluded that:

- . AMASCOT system demonstrated that GPS, in combination with other technologies, is capable of being used to accurately record and accumulate miles for fuel tax and licensing reporting purposes;
- . AMASCOT system fulfills the basic intent of IFTA and IRP mileage record-keeping requirements. Minor adjustments, as outlined ???, will allow such a system to meet all requirements;

- . Such technology is capable of providing an automatic, completely electronic alternative method to the current practice of drivers keeping mileage records by hand on an IVDR. The documents reviewed indicate the potential to increase the accuracy of mileage data and to provide both time and cost savings for jurisdictional processing and audit functions;
- . Mileage data generated by the test system demonstrated the potential to increase the accuracy of mileage by jurisdiction data. In fact, the auditors felt that the jurisdictional distribution of mileage was more accurate using the data collected by the automated electronic mileage data collection system, since available time and routing information indicated that border crossing readings were being taken at or very near the point and time of actual border crossing.

Truck System And Electronic Data Interchange Evaluation Conclusions

The truck system and ED1 evaluation has shown that automated data collection is feasible and can meet IFTA and IRP requirements, that an electronic data path is feasible, and that motor carrier implementation costs will be relatively affordable. Independent of the findings of the evaluations of state and motor carrier costs, benefits, and acceptance, these findings clearly demonstrate the technical and practical feasibility of electronically collecting mileage by jurisdiction data and integrating this data into both current systems and more advanced systems able to accommodate end-to-end electronic data paths for IFTA and IRP data collection, processing, and reporting to a base jurisdiction.

With the viability of the concept proven, states and motor carriers can move ahead to solve the related issues of ED1 standards, ED1 facilities, and electronic funds transfer and clear the way for implementation of similar technologies and processes for streamlining IFTA and IRP administration and compliance for both states and motor carriers.

SUMMARY OF STATE COSTS, BENEFITS, AND ACCEPTANCE EVALUATION FINDINGS

The evaluation of state costs, benefits, and acceptance accomplished the following evaluation goals:

- . document current processes and costs of IFTA and IRP processing and auditing administration and identify possible impacts of automated data collection and electronic filing on these processes and costs;
- . determine participating states acceptance of the automated method and their willingness to change the method of processing;
- . document legal and institutional issues related to automated data collection and electronic filing for IFTA and IRP.

The state evaluation used a case study approach for each of the three participating states--Iowa, Minnesota, and Wisconsin. This methodology allowed the evaluation to accommodate the differences among states. Each state case study examined the following areas:

- . processes for IFTA processing;
- . processes for IFTA auditing;
- . current costs for IFTA functions as identified by states;
- . potential benefits and changes in current processes resulting from automated, electronic mileage data collection and filing;
- . perceptions of state processing and auditing personnel regarding potential benefits and their likelihood;
- . possible barriers to state implementation.

The state evaluation focused on IFTA processes and costs because IRP filing is less frequent than IFTA (therefore a smaller part of state work), uses the same mileage data, and is often audited in conjunction with IFTA filings. Benefits identified for IFTA processing and auditing are also applicable to IRP, though to a lesser extent in processing due to the IRP requirement for only a single mileage report annually versus the IFTA requirement for fuel and mileage reporting quarterly.

In the case studies, two basic methods were used to investigate these areas: 1) site visits and interviews with state processing and audit personnel and 2) questionnaires distributed to both processing and audit personnel.

The evaluation findings are summarized in general for all three states. For more information on the state evaluation, see the AMASCOT Evaluation Report on State Costs, Benefits, and Acceptance.

Potential Benefits And Cost Savings For Ifta Processing And Auditing Administration

The examination of processes, costs, and benefits was not expected to result in a traditional cost-benefit analysis due to differences in state costing methods, varying availability of cost data, and a reluctance by states to estimate the effects of automated data collection and electronic filing on their costs for IFTA administration. Rather, the cost data available allowed a tabulation of the current state costs as identified by the participating states and identification of the areas of the process that could be positively affected by automated, electronic mileage data collection and electronic filing.

Processing Benefits

Currently, mileage data is recorded manually by the driver and turned in to the carrier for reporting purposes. The data is then entered on a manual form by the motor carrier staff, mailed into the state agency, and re-keyed into the state processing system by the state processing personnel. With automatic mileage data collection and electronic fuel tax reporting, fuel tax returns could be processed electronically. Motor carriers or their service providers could collect

electronic data from the vehicle, use this data to generate IFTA quarterly reports, and submit these reports to the base state via EDI. For Iowa, Minnesota, and Wisconsin, automated, electronic mileage data collection and electronic filing offers the following benefits for IFTA processing:

- . **Reduced labor costs for opening, sorting, and delivering mailed-in, manual returns.**
- . **Reduced data entry** due to electronic filing.
- . **Reduced problems related to hand-written filings.** Most carriers compile the necessary IFTA data, make the necessary calculations for IFTA, and then hand write the IFTA return. These hand-written returns often create legibility problems for states. Electronic returns would reduce the number of hand-written returns and the associated legibility problems.
- . **Reduced base state follow-up due to IFTA filing errors.** The use of electronic data and filing reduces the opportunities for motor carriers to make mistakes in their IFTA filing. Reduced errors lessens the need for the base state to follow-up with carriers for corrected filings.
- . **Reduced labor for verification and data entry of payments through electronic funds transfer (EFT).** Along with receiving returns electronically, funds due could also be received electronically. EFT would eliminate the need for processing personnel to verify the payment, enter it on the system for deposit, and reconcile reports and payments manually.
- . **Reduced labor and mail costs associated with preparing mailings for manual returns.** Currently, the base state sends each IFTA registered carrier manual return forms every quarter. These mailings could be eliminated for those carriers who would be filing electronically if the IFTA rates are made available to carriers electronically,
- . **Reduced labor and storage space/materials costs related to retaining and using data.** Electronic data would reduce time required for storage and retrieval of filing data and reduce the physical space and materials (paper, file folders, etc.,) necessary.
- . **Reallocation of staff where additional help is needed.** Reductions in the staff time required to complete IFTA report processing will allow shifting of resources to other areas such as assisting companies reporting for the first time or to other areas of motor carrier regulatory administration.

Auditing Benefits

Potential IFTA/IRP auditing benefits for the participating states from electronic mileage data collection were identified as the following:

- . **Time savings (resulting in more audits) due to improved data accessibility.** During the actual audit, auditors spend a significant amount of time searching through paper documentation at the carriers site and then entering the data into auditing software (usually a spreadsheet program and a route mileage program). Electronic information would reduce these manual steps and be more easily queried to facilitate faster and easier audits. By reducing the time needed for each audit, the states could audit many more carriers per year.
- . **More in-house audits due to improved data portability.** The feasibility of in-house audits is increased substantially by electronic data, The mileage and fuel purchase data requested by auditors could be supplied in electronic format much more easily than current paper records can be, thus enabling in-house audits for larger motor carriers. More in-house audits would result in:
 - . More audits Less time spent traveling creates more time for audits.
 - . Less travel expense
- . **Better targeting of resources.** Electronic data would allow auditors to more easily request data samples for “pre-audits.” Audits of these limited electronic data samples could be combined with phone interviews and other information to assess whether a motor carrier needs more auditing attention. With reduced time in accessing and using electronic data, these “pre-audits” could reach more carriers. Such “pre-audits” could indicate potential trouble areas in a motor carrier’s process more quickly than a manual limited review.

State Agency Perceived Benefits And Receptivity

To identify the benefits expected by processing and auditing staff and gauge their receptivity for electronic mileage data collection and electronic filing, short questionnaires were distributed to the Iowa DOT IFTA processing and auditing staffs. The questionnaires were designed to provide a general measure of the staffs’ knowledge and attitudes toward the AMASCOT project, their perceptions of the benefits of electronic mileage data collection and electronic filing and the likelihood, and their receptivity toward implementation of electronic mileage data collection and electronic filing.

Because the sample size was small and concerns over survey length kept the questionnaires short, the questionnaires were not intended to support statistical analysis, but instead to provide indications of the general perceptions and receptivity of the target group toward automated electronic data collection and electronic filing for IFTA and IRP. Following is a summary of results from both the processing and auditing perspective.

Perceived Benefits

As part of the state evaluation, state IFTA/IRP processing and auditing staffs were asked to indicate possible benefits from electronic mileage data collection and electronic filing and the most likely impacts of the indicated benefits on their work.

Processing staff expect that automated mileage data collection and electronic filing would result in:

- . increased reporting accuracy
- . reduced data entry
- . more efficient data storage and retrieval
- . less time spent resolving inaccuracies and more reliance on their IFTA processing software to determine inaccuracies
- . use of time savings to recheck the accuracy of their own work, complete additional tasks of their own, help others with their tasks, or assume additional responsibilities

While these processing benefits are possible for the participating state agencies, the impact or value of these benefits is difficult to estimate in any meaningful way. These benefits are dependent on the number of motor carriers who implement electronic data collection and filing, which is difficult to predict in a potentially emerging marketplace. In addition, costs identified by the states indicate that IFTA processing costs less than \$125,000 per year. Consequently, electronic data collection and filing would have to reduce processing costs by a very high percentage to result in large monetary savings.

However, these agencies are currently operating with reduced staff resources, resulting in considerable difficulty in maintaining the desired levels of service. As a result, the benefits to these states are not likely to be in the form of direct money cost-savings, but in the form of staff time that can be reallocated to maintaining other necessary motor carrier services or enhancing IFTA/IRP and other motor carrier services as needed. In short, electronic mileage data collection and filing could make the states' motor carrier agencies more productive and better able to accommodate current and future demands on staff.

Auditing staff expect that automated mileage data collection and electronic filing would result in:

- . ability to audit the electronic data using specially developed audit software
- . improved ease of querying information
- . decrease in time required to perform audits
- . improved data accessibility resulting in greater audit efficiency
- . increased reporting accuracy
- . time saved would be utilized to conduct more audits, review their own work more thoroughly to ensure accuracy, help others with unfinished tasks, or take on additional responsibilities

If these benefits are actually realized, auditors project cost savings from less manual data entry and higher reporting accuracy. Some cost savings were also foreseen with decreased audit time. Auditors expected very little cost savings from decreased travel and expected no cost savings from decreased mailings to motor carriers.

Receptivity To Electronic Mileage Data Collection And Electronic Filing

The state evaluation also asked state IFTA/IRP processing and auditing staff to indicate their receptiveness to implementation of electronic mileage data collection and electronic filing and their expectations on which benefits would accrue from implementation of such a system.

Processing staff were generally:

- receptive to automatic mileage data collection for IFTA reporting
- receptive to electronic filing of IFTA reports
- optimistic that all identified benefits were very likely to occur

However, there was an underlying current of apprehension about job security, particularly among workers from Wisconsin, a state currently facing severe budget limitations and the attendant cost cutting issues.

Auditing staff were highly:

- receptive to the electronic fuel tax data collection and reporting device
- optimistic that the device would be acceptable among the auditing community
- optimistic about the benefits to be realized with electronic mileage data collection and filing, believing that such a system will improve accuracy, provide a cost savings to states and motor carriers, and provide the opportunity to conduct more audits

State Legal And Institutional Issues

The evaluation objectives included identification of legal and institutional issues encountered during the project or likely to be faced if states want to implement automated electronic mileage data collection and filing. No legal issues were uncovered during the test or the evaluation, and contracting issues were limited solely to the contract with the technology provider. A number of institutional issues were uncovered as well. Contracting and institutional issues are discussed in the following sections.

Institutional Issues

Analysis of the three participating states' processes and staff perceptions uncovered several institutional issues. These issues are not unique to the study states, and some or all are likely to exist in every state. These issues include:

- . **Lack of EDI standards for transmitting IFTA and IRP reporting data from motor carriers or their agents to states.** Currently, there is no standard for submitting electronic data to states for IFTA and IRP reporting. None of the states involved in the project were routinely accepting data from motor carriers in an electronic format. Without such a standard, states, motor carriers, and technology providers are reluctant to move forward with EDI at risk of having their efforts discarded when standards are developed.
- . **Lack of electronic method of payment to facilitate electronic filing of IFTA and IRP data.** IFTA and IRP require that payment accompany the filing document. As a result, electronic data transfer of IFTA and IRP reporting data would require some means to enable payment at the time the data is accepted by a state. State agencies that participated in the test have limited or no experience with methods for EFT, the most efficient method to allow motor carriers or their agents to provide means of payment with their electronic submissions.
- . **Lack of facilities to accept electronic data.** While all the participating state agencies were interested in EDI for IFTA and IRP filing, none of them have facilities in place to accept electronic data from outside sources. Until states implement some means of easily receiving and integrating electronic data from outside sources into their data processing systems, EDI for IFTA and IRP cannot be executed.
- . **Staff resistance to electronic filing due to concerns over job security.** One human concern states may encounter when automating portions of the IFTA and IRP filing process is staff resistance, mostly due to concerns over job security.

Fortunately, these issues have very real and achievable solutions, many of which are already being put in place through other efforts. In the case of EDI standards, states are working through the IFTA and IRP organizations to develop the data standards necessary for EDI between states and between motor carriers or their agents and states. In addition, the states participating in AMASCOT as well as others are currently involved in other operational tests (i.e... electronic one-stop credentialing projects) that are also working to address the issues of EDI between states and motor carriers as well as electronic payment and development of the infrastructure facilities and processes to support EDI.

State Evaluation Conclusions

Clearly, the implementation of electronic mileage data collection and electronic filing for IFTA and IRP compliance promises benefits to states' IFTA/IRP processing and auditing processes.

Analysis of state agency IFTA processing and audit processes identified a number of potential benefits due to electronic mileage data collection and electronic filing, and many of these potential benefits were also perceived as likely by IFTA processing and auditing staff.

States can benefit from automated electronic mileage data collection and electronic filing for IFTA and IRP compliance through reduced staff inputs for data entry, ensuring the integrity of the data received, reduced data storage requirements, and increased data accessibility and portability. The extent of these benefits will vary by state, but will mainly be influenced by the rate of implementation of such systems by motor carriers.

State auditing and processing supervisors agreed that the impact of electronic mileage data collection and filing on their systems is dependent on the level of implementation by Iowa-based motor carriers and that large impacts would not be realized until implementation had filtered down to carriers of less than ten trucks. However, these auditing and processing supervisors also indicated that benefits accrued from implementation of electronic mileage data collection and filing by larger motor carriers (more than 50 trucks) and equipment leasing and service firms would be significant enough to be worthwhile.

However, states face a number of institutional issues in implementing automated electronic mileage data collection and electronic filing for IFTA and IRP. Fortunately, these issues have achievable solutions and many are being addressed through other efforts as well. The most significant turning point will be when the IFTA and IRP communities acknowledge acceptance of these technologies for IFTA and IRP compliance. Such acceptance will allow implementation of these technologies by states and motor carriers that perceive an appropriate level of benefit.

Summary Of Motor Carrier Benefits And Acceptance Evaluation Findings

The evaluation of motor carrier acceptance and benefits was designed to provide insight into current motor carrier processes for fuel tax and registration mileage reporting, the acceptability of an AMASCOT-like system, the possible motor carrier benefits, and the likelihood of motor carrier implementation of electronic mileage data collection and filing. The motor carrier acceptance and benefits evaluation focused on:

- . possible benefits of automated mileage and route data collection and EDI for IFTA/IRP reporting
- . estimated impact of automated data collection and EDI for IFTA/IRP reporting on current costs of compliance
- . suitability of an automated data collection system for motor carrier implementation
- . feasibility of and issues related to implementation by motor carriers

The motor carrier evaluation was conducted through post-test interviews, which were supported by preparatory activities. These activities included a worksheet to help motor carriers estimate the costs associated with current processes for IFTA compliance and assistance in interpreting the AMASCOT mileage and route records and comparing them to corresponding driver trip records.

Key Motor Carrier Evaluation Findings

Analysis of the motor carrier evaluation interviews and supporting information resulted in the following evaluation findings.

Motor Carrier Acceptability

- **Accuracy and reliability are the key attributes motor carriers identified as necessary for mileage and route data recorders.** Rapid, convenient repairability was also a frequently mentioned expectation of motor carriers.
- **Excellent correlation between the AMASCOT mileage and route data and driver recorded mileage and route data.** While only four of the six carriers indicated they had examined the travel data reports produced by AMASCOT, three of these four reported finding excellent mileage data correlation (ratings of 4.5, 5 and 5 on a 1-5 scale with 1 equaling unacceptable).
- **Good correlation between the IFTA-style reports produced by AMASCOT and motor carriers' IFTA reporting.** The only correlation problems identified by motor carriers were related to differences in data cut-off dates between the AMASCOT processing and the motor carriers' own processing.
- **EDI for transfer of IFTA and IRP reports to the states is not a priority for motor carriers.** Of the six participating motor carriers, two utilize ED1 routinely and indicated it is a low priority for IFTA and IRP reporting since the benefits are negligible (states would accrue the benefits from ED1 reporting in reduced data entry, data errors, and mail handling).

Motor Carrier Issues

- **Motor carriers expressed concern that the time and location detail included in the mileage and route data could compromise their privacy.** Motor carriers were concerned that regulatory agencies might use the data outside the intended context of fuel tax and registration mileage compliance.
- **Motor carriers expressed concerns over how to manage access to their electronic records during an audit.** While motor carriers agreed with the concept of being able to audit the electronic data using software methods, they voiced strong concerns over how the data might be accessed. Motor carriers indicated a preference for uploading or supplying on diskette the data requested for audit rather than attempting to "limit access" within their corporate computer system.

Motor Carrier Costs/Benefits

- **Nearly all of the participating carriers agreed that an automated mileage and route data collection system had the potential to reduce the costs of IFTA and IRP compliance.** Possible costs savings identified were associated with reduced data entry, reduced data errors and associated reconciliation, and reduced paperwork.
- **Automated mileage and route data collection could reduce IFTA and IRP reporting costs by as much as 50 percent for the participating carriers, but must have additional uses and benefits to result in widespread motor carrier implementation.** Participating motor carriers indicated that automated mileage data collection has the potential to reduce IFTA and IRP reporting costs by 33 to 50 percent. These carriers also indicated, however, that an automated mileage data collection system like that used in AMASCOT would be considered for implementation only if it is accompanied by additional functionality and corresponding benefits.

Motor Carrier Evaluation Conclusions

The AMASCOT demonstrated that technology is capable of automatically collecting mileage and route data for IFTA and IRP compliance. Participating motor carriers found excellent correlation between the AMASCOT data and mileage and route data collected by their drivers. These carriers also agreed that this data could easily be used to generate IFTA and IRP reports.

With automated data collection proven feasible, motor carriers participating in AMASCOT agreed that significant benefits could be available through automated mileage and route data collection for IFTA and IRP compliance. Primarily, benefits could be accrued through reduced data entry, reduced data errors and associated reconciliation, reduced paperwork, and electronic record keeping. A majority of these carriers identified significant potential cost savings from automated mileage and route data collection. These potential savings were estimated to be from 33 to 50 percent of current IFTA and IRP administration costs.

However, motor carriers also identified privacy issues associated with electronic mileage and route data, particularly related to limiting use of and access to their data. Fortunately, motor carriers offered possible solutions to these issues, suggesting that these issues will not be insurmountable.

Lastly, automated mileage and route data collection is most likely to be implemented by larger motor carriers with more technologically advanced business information systems. This agrees with the conclusions of the evaluation work on costs of implementation. These motor carriers will pioneer the use of automated mileage and route data collection for IFTA and IRP compliance as well as for other business functions, ultimately demonstrating its economic viability and paving the way for more widespread implementation.

More detailed information regarding the motor carrier evaluation can be found in the AMASCOT Evaluation Report on Motor Carrier Acceptance and Benefits.

EVALUATION SUMMARY OF TECHNOLOGY TRANSFER EFFORTS

Technology transfer efforts for the AMASCOT project included a project newsletter; presentations at professional meetings; presentations in support of other research efforts; and dissemination of project reports and other information as requested. This report focuses on the the efforts related to the newsletters and presentations.

Newsletter

The AMASCOT newsletter consisted of four, four to six page issues published quarterly. The newsletter was distributed to all project partners, the FHWA regional offices, all 50 American Trucking Associations affiliated state trucking associations, and other interested parties as requested. To help facilitate newsletter dissemination, each issue included a small address form and subscription request that allowed readers to request their inclusion on the mailing list.

Success of the newsletter for disseminating project information was good. Over 700 copies of each issue of the newsletter were distributed for each of four issues. Each issue generated a modest number of requests for inclusion on the newsletter mailing list.

Problems related to the newsletter were generally limited to timely cooperation by project partners in providing information for publication. With the first priority being successful completion of the project, publication of the newsletter was often delayed while waiting for crucial information from the partners.

Overall, the newsletter was successful, but some means of ensuring partner support for providing information for publication was needed. For future projects incorporation a newsletter or other periodic publication, delineation of newsletter responsibilities could be outlined specifically as deliverables in the project contracts.

Presentations

A number of presentations for the AMASCOT project were made by the project partners at professional meetings of state fuel tax and registration administrators and auditors, motor carriers, and others. These efforts included presentations at:

- . IFTA Annual Meeting
- . IFTA Audit Subcommittee Meeting
- . Highway Safety Forum on Technological Innovations in Vehicle and Highway Safety

In addition to the presentations at professional meetings, efforts were also made to provide AMASCOT information to other ITS-CVO research efforts, particularly state institutional issues studies. Presentations on AMASCOT were made in support of these research efforts:

- . North Dakota and South Dakota ITS-CVO Institutional Issues Study
- . Massachusetts ITS-CVO Institutional Issues Study
- . Connecticut ITS-CVO Institutional Issues Study

The presentations were a very effective method of sharing information about AMASCOT and generating interest among states and motor carriers in AMASCOT and ITS-CVO. Considerable requests for information about AMASCOT were generated following each presentations. In addition, requests for presentations to other groups were made after the project was completed but could not be accommodated since project funds were no longer available.

Technology Transfer Conclusions

Technology transfer efforts for the AMASCOT were successful, resulting in substantial interest in the electronic mileage data collection and filing by state agencies, motor carriers, and technology and service providers. Issues related to technology transfer include difficulties with partner participation in the newsletter and identification of a need for funding for post-project presentations, both of which are easily addressed. Partner participation issues could be relieved by including newsletter participation as part of contract deliverables. Funding for post-project presentations could be addressed by identifying funds for use in technology transfer after project completion.

EVALUATION CONCLUSIONS

AMASCOT has proven the feasibility of automated mileage data collection and electronic filing for streamlining state and motor carrier processes for administration of fuel tax (IFTA) and registration (IRP) apportionment. The combination of GPS with other technologies is capable of accurately identifying and recording jurisdictional border crossings and mileage traveled by a vehicle, and this data can meet IFTA and IRP requirements.

The AMASCOT has also shown that both states and motor carriers expect to reap benefits from an automated mileage and route data collection system and EDI. For motor carriers, the costs to benefits ratio is dependent on the motor carriers' level of business information automation and the extent to which implementing automated mileage and route data collection would be an extension of current fleet management practices. For states, the costs to benefits ratio is mostly dependent on the rate of implementation of automated mileage and route data collection and EDI for IFTA and IRP reporting by motor carriers. As more motor carriers implement such systems, states reap greater benefits without additional costs.

NEXT STEPS FOR IMPLEMENTATION

Clearly, AMASCOT has demonstrated that the feasibility and potential benefits of automated mileage and route data collection and electronic reporting for IFTA and IRP compliance should interest states and motor carriers in implementation of such systems. In fact, three technology providers (Rockwell, Highway Master, and Qualcomm) have announced plans to develop and market AMASCOT-like mileage and route data collection systems. Such competition in a new market place should quickly bring down the costs of motor carrier implementation, further encouraging widespread motor carrier implementation-

States need to move forward to support these private sector investments, encourage implementation, and reap benefits of their own. The next steps for achieving widespread implementation include:

- . Formal acceptance of automated mileage and route data collection systems by states. The IFTA and IRP agreements enjoin states to accept electronic data collection methods that meet IFTA and IRP requirements. However, to encourage implementation by motor carriers, states need to formally recognize the validity of these systems and work with interested motor carriers and technology providers to promote implementation.
- . Establish state capability for EDI and electronic payment between motor carriers and states. For states to achieve significant benefits, EDI and electronic payment are necessary to remove the paperwork in IFTA and IRP reporting. Since states are not generally equipped for EDI and electronic payment between their agencies and motor carriers, a good deal of work will need to be done to put EDI and electronic payment systems in place.

These next steps are straightforward. States only need to make a commitment to achieving them and both motor carriers and states will reap the benefits of moving commercial vehicle regulatory administration into the information age.